

# Extending the “Deep Blue” aerosol record from SeaWiFS and MODIS to NPP-VIIRS

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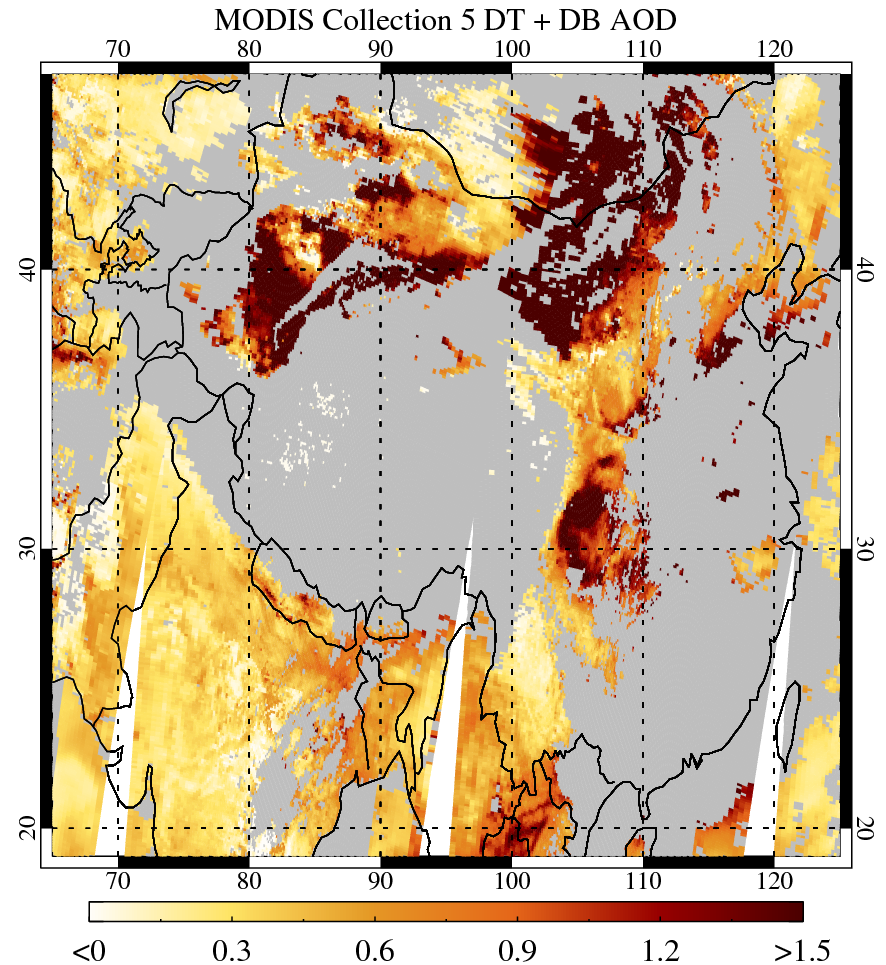
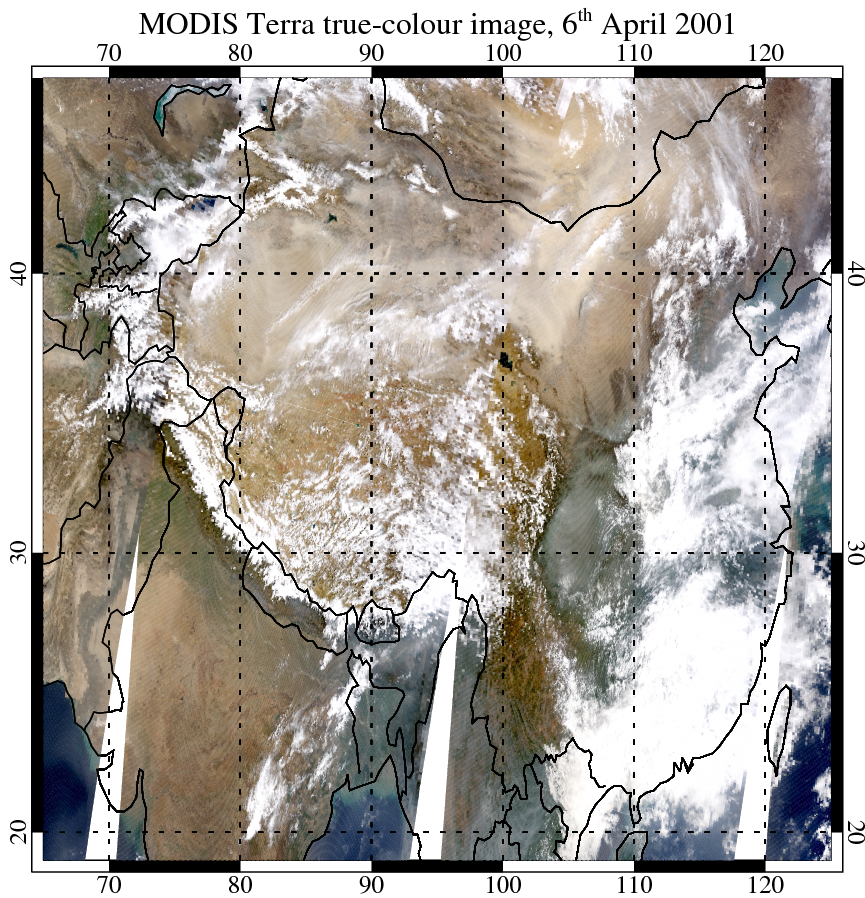
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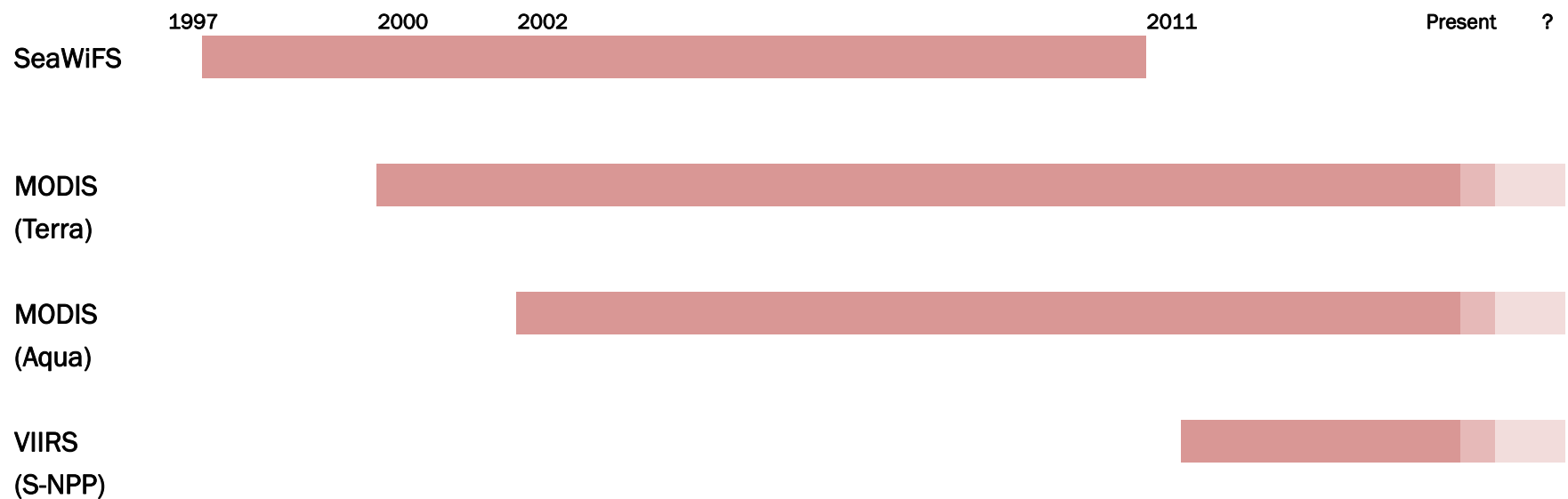
With acknowledgements to the MODIS/VIIRS Characterization Support Team, AERONET, and the Ocean Biology Processing Group



# Deep Blue expands AOD coverage to deserts and other bright surfaces



# Using multiple similar satellite sensors enables us to obtain a long data record



# The Deep Blue family consists of three separate aerosol optical depth (AOD) retrieval algorithms

## Bright land

Surface reflectance database, BRDF correction

AOD retrieved separately at each of 412, 470/490, (650) nm

SSA retrieved for heavy dust events

## Dark land

Spectral/directional surface reflectance relationship

AOD retrieved separately at 470/490 and 650 nm

## Water

Surface BRDF including glint, foam, underlight

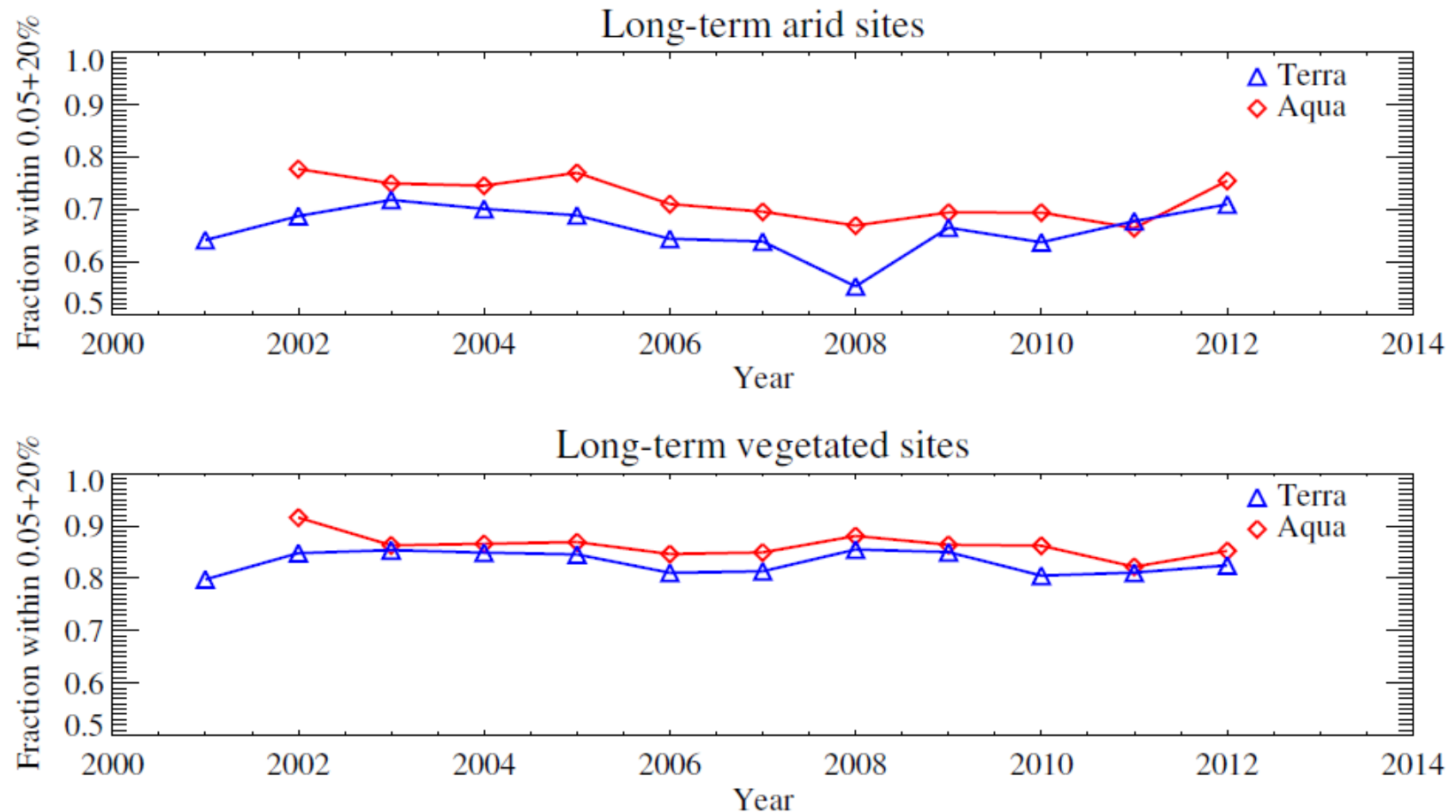
Multispectral inversion

(Not present in MODIS dataset)

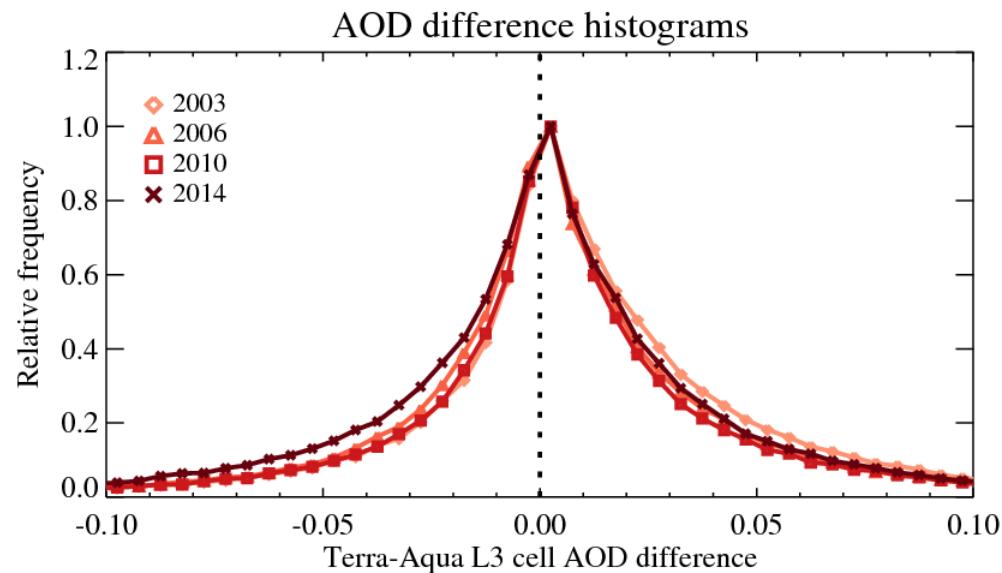
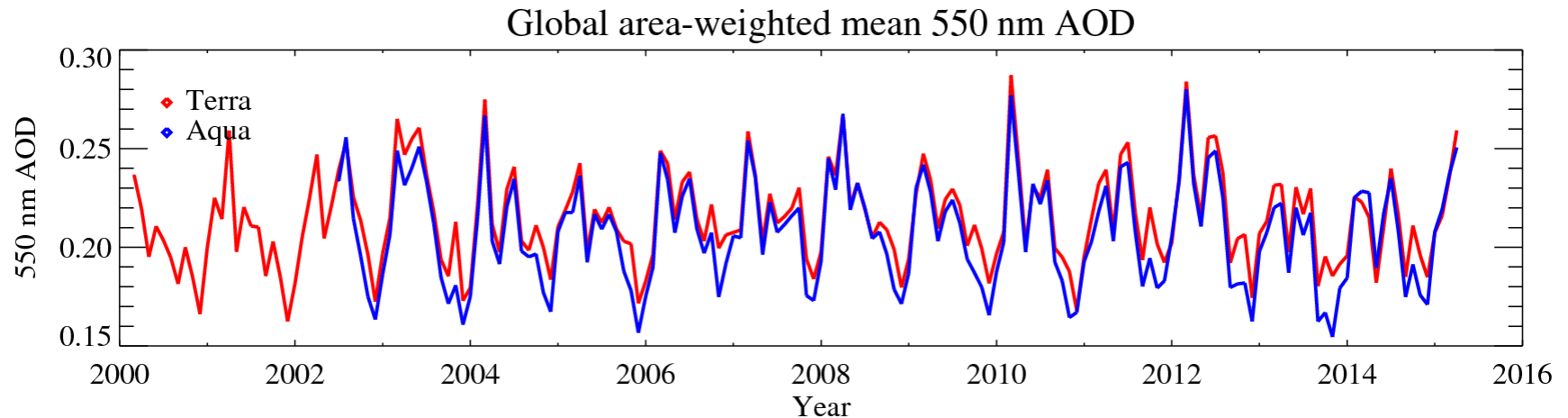


All report the AOD at 550 nm, and Ångström exponent (AE)

MODIS Collection 6 data for Terra and Aqua are now both available, and show good long-term stability

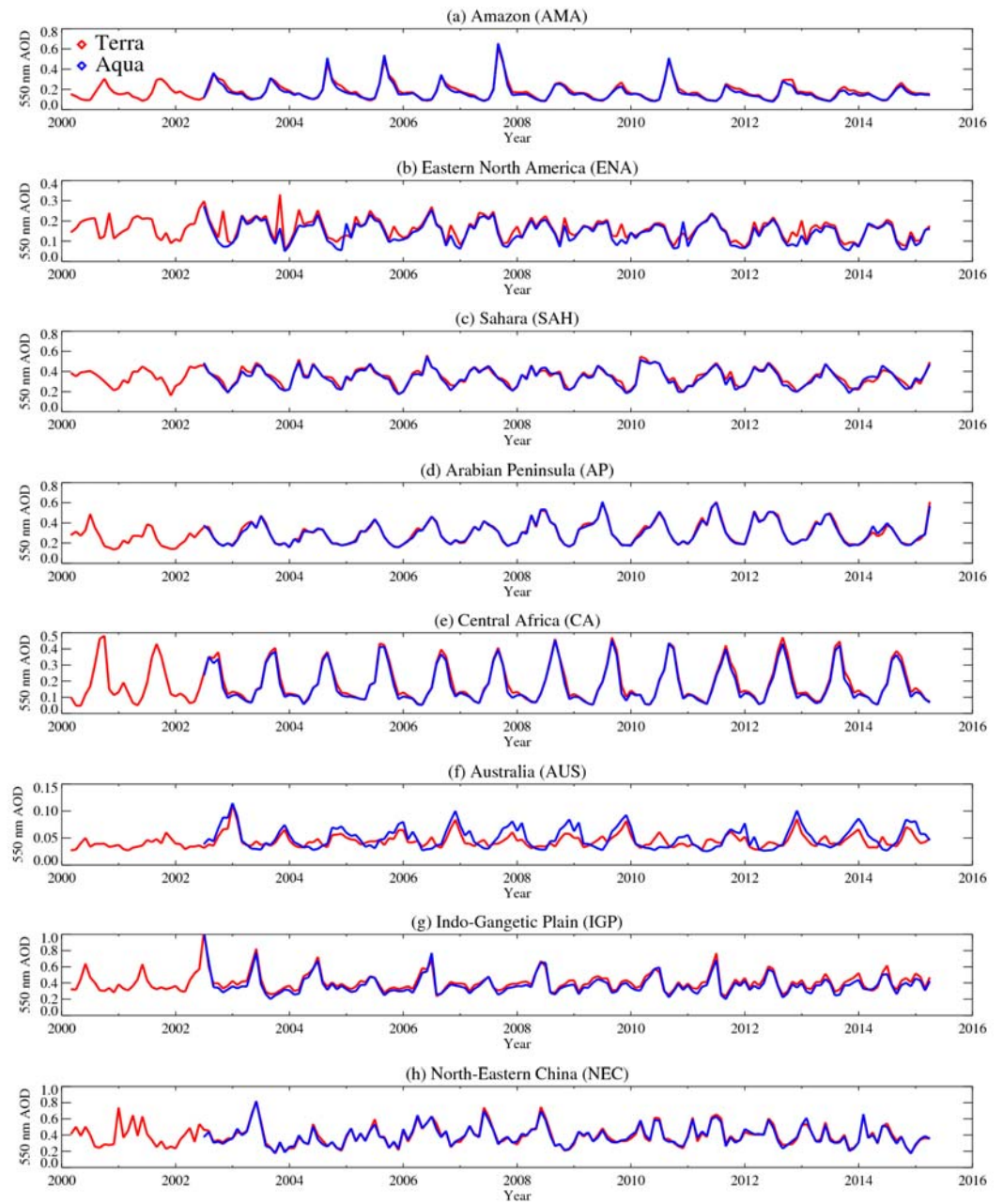
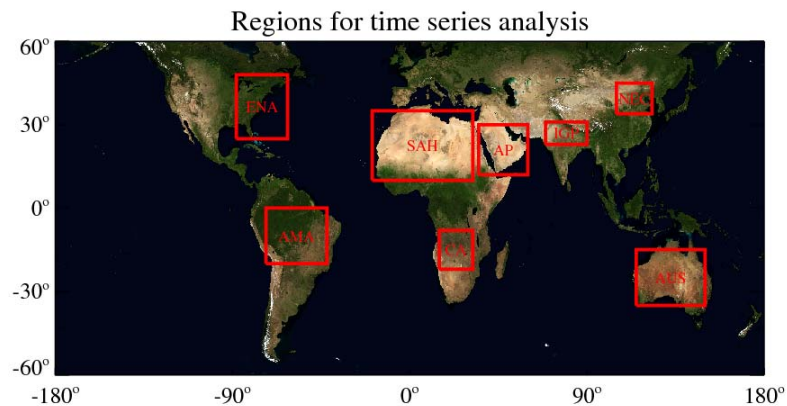


Terra/Aqua time series track each other closely;  
Terra has a fairly consistent high AOD offset  $\sim 0.005$



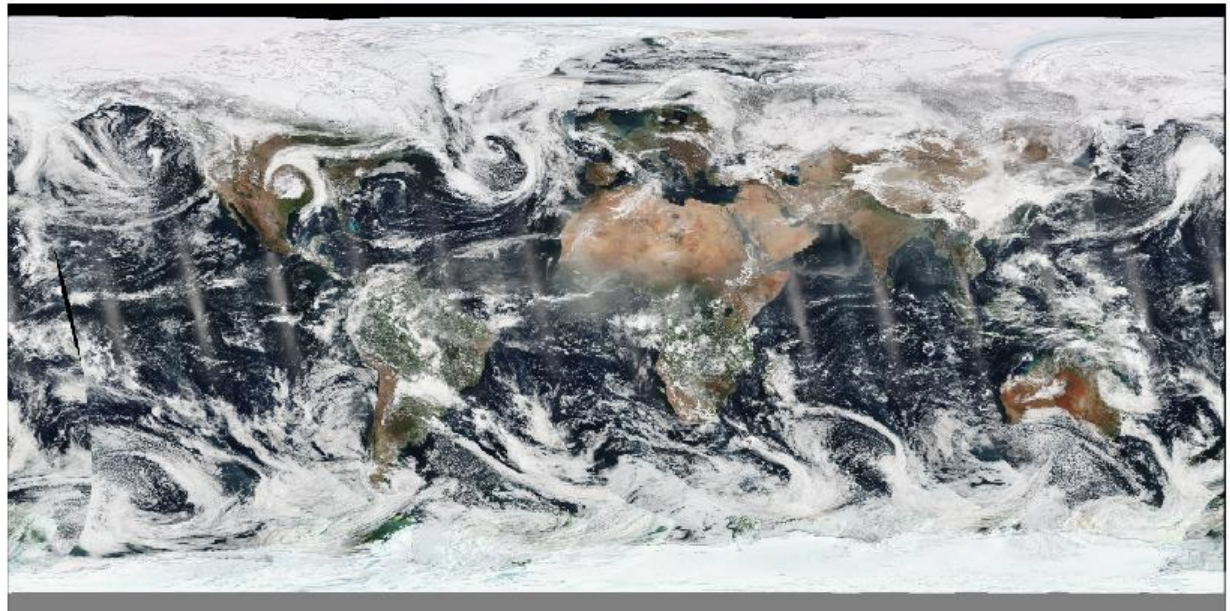


Regionally, the two sensors show consistent seasonal and interannual variability



# The Visible Infrared Imaging Radiometer Suite (VIIRS) was launched on S-NPP at the end of 2011, and is similar\* to SeaWiFS and MODIS

- Spectral range  
412 nm – 12  $\mu\text{m}$
- Swath width  
~3000 km
- M-band resolution  
~0.75 km



VIIRS RGB (True Color) 2012-03-22

R : M05 (0.672  $\mu\text{m}$ ); G : M04 (0.555  $\mu\text{m}$ ); B : M03 (0.488  $\mu\text{m}$ )

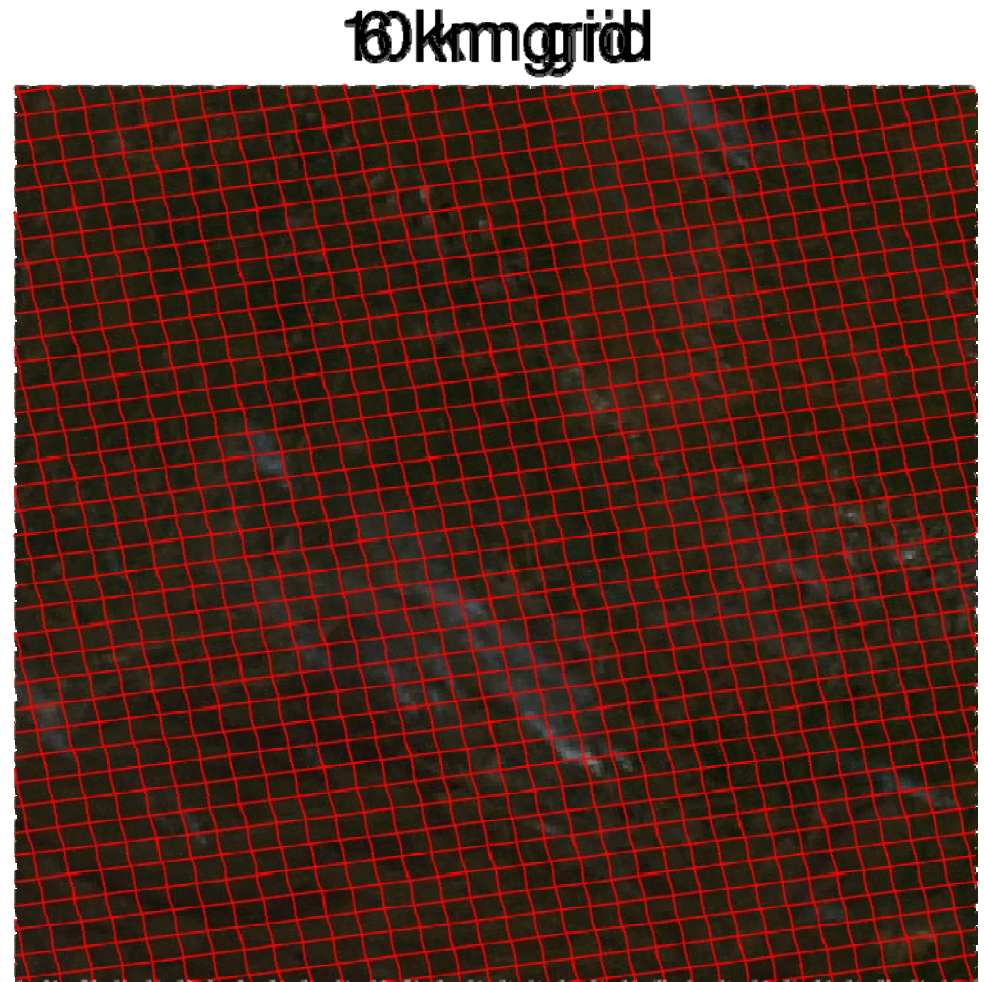
Image courtesy Wisconsin Atmospheres PEATE/SIPS

\*for our purposes



# VIIRS Deep Blue will extend and improve on MODIS heritage products

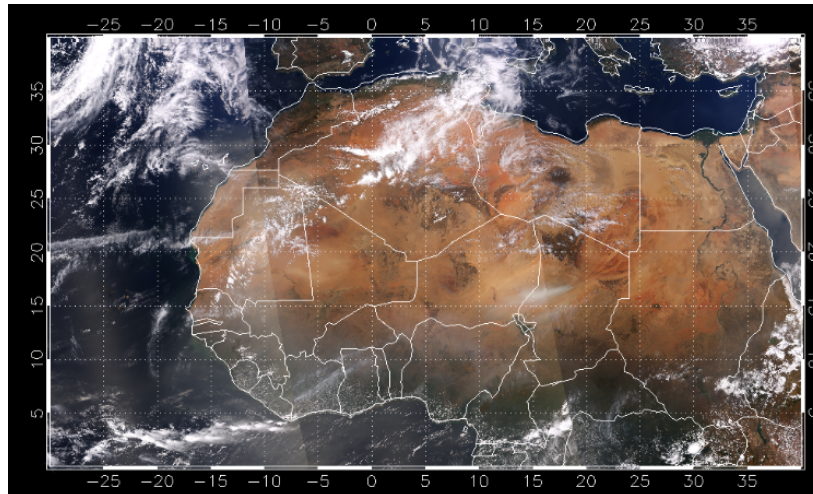
- Spatial resolution 6 km
  - Reduced scan-edge pixel growth compared to MODIS
- Pixel-level AOD uncertainty estimates (eventually)
- Pixel-level quality assurance (QA) flags
  - Files will include additional QA-filtered datasets
- Levels 2 (swath-level) and 3 (daily/monthly aggregate) products
- Full mission (re)processing(s) with consistent algorithm and calibration



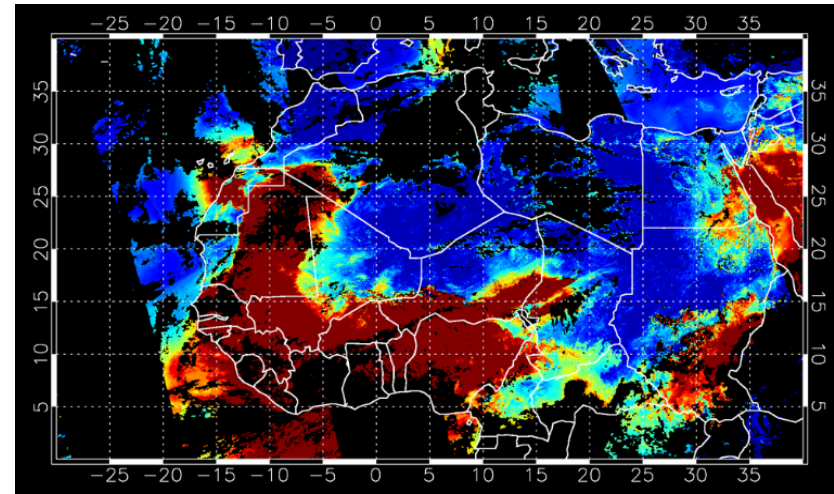
Fires in Africa: 10-12 °S, 21-23 °E  
MODIS Aqua, June 1 2006, 12:05 UTC

# NASA VIIRS Deep Blue covers more surface types than NOAA VIIRS, without the inter-orbit gaps of MODIS

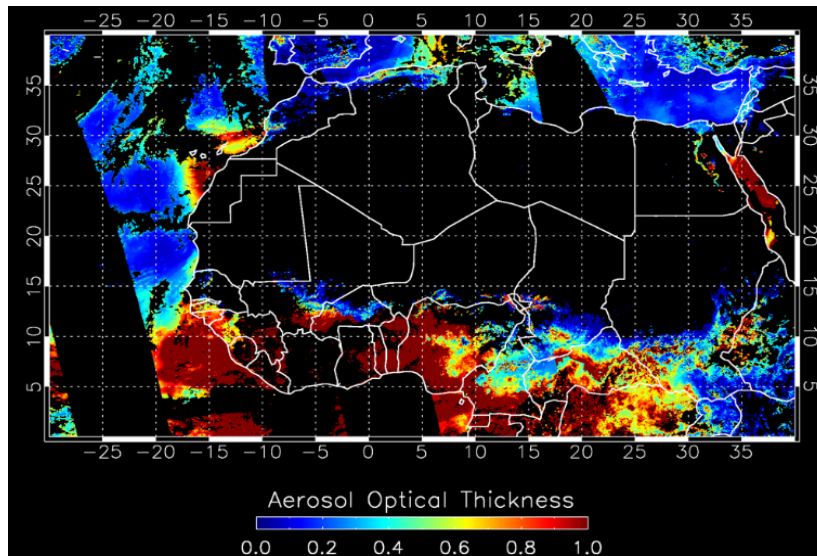
S-NPP/VIIRS RGB March 22, 2012



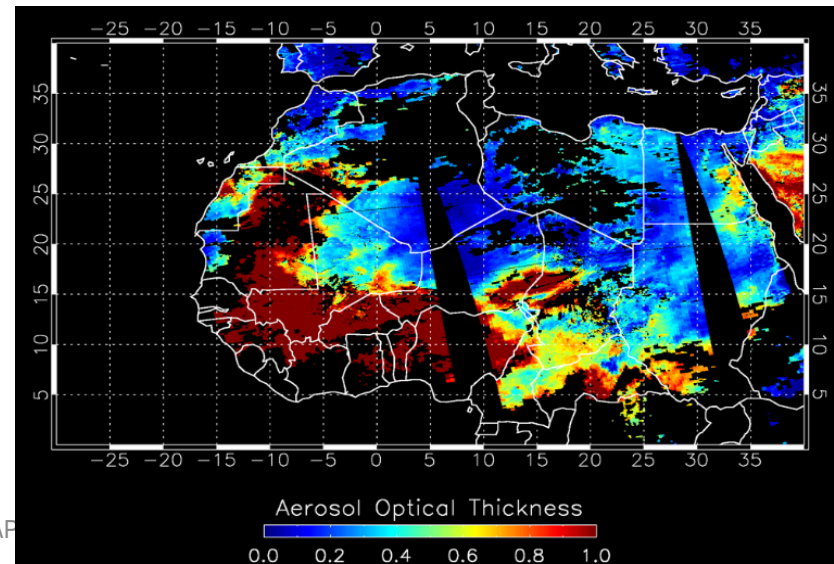
VIIRS Deep Blue AOD



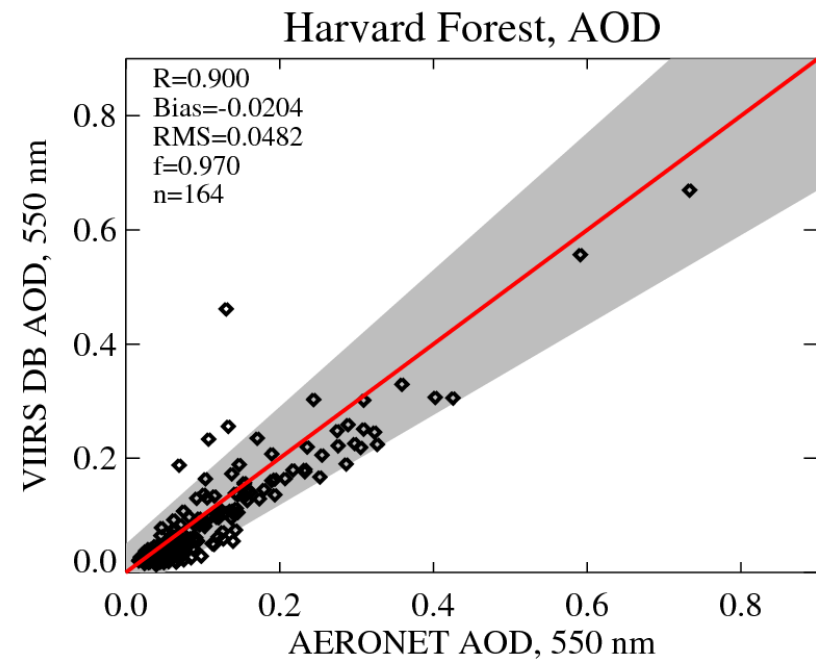
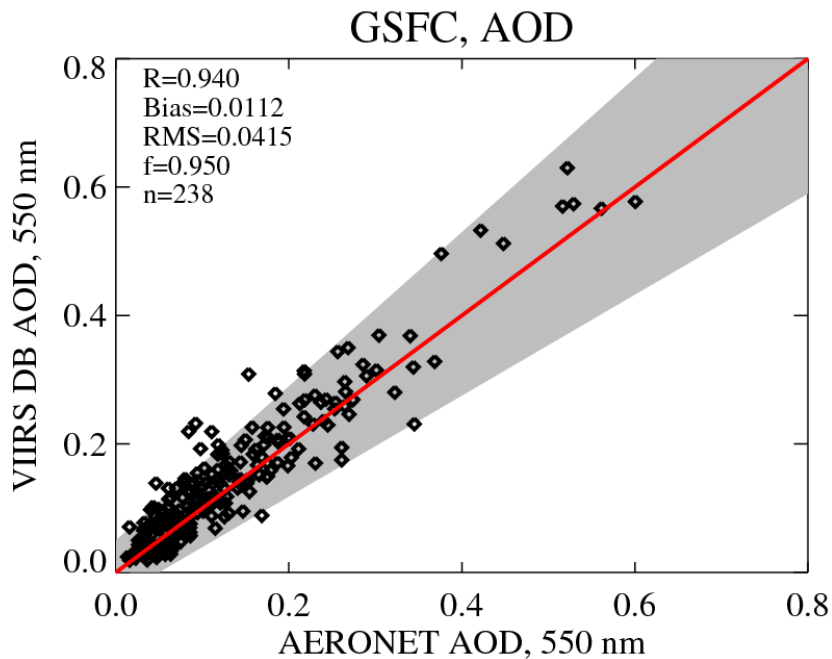
NOAA VIIRS (IDPS) AOD



MODIS C6 AOD



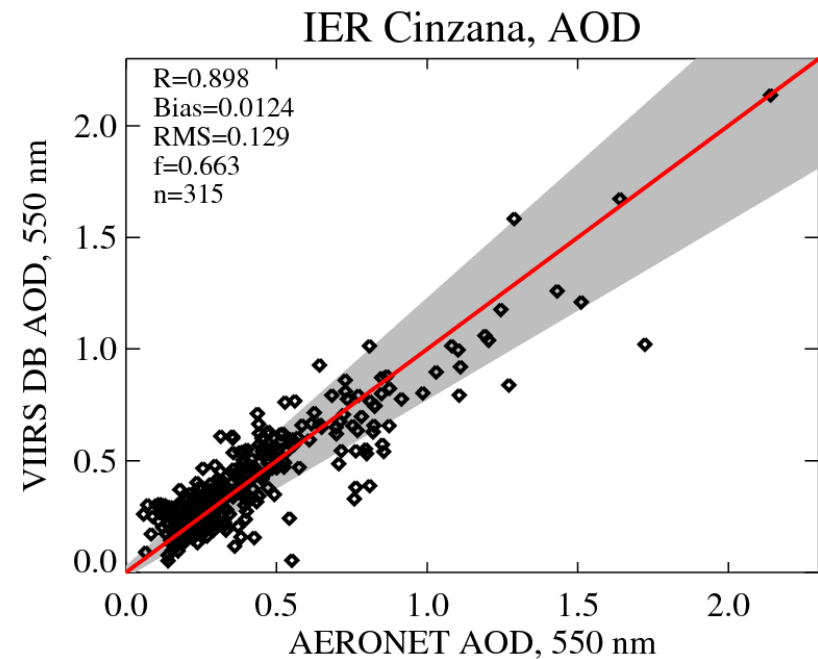
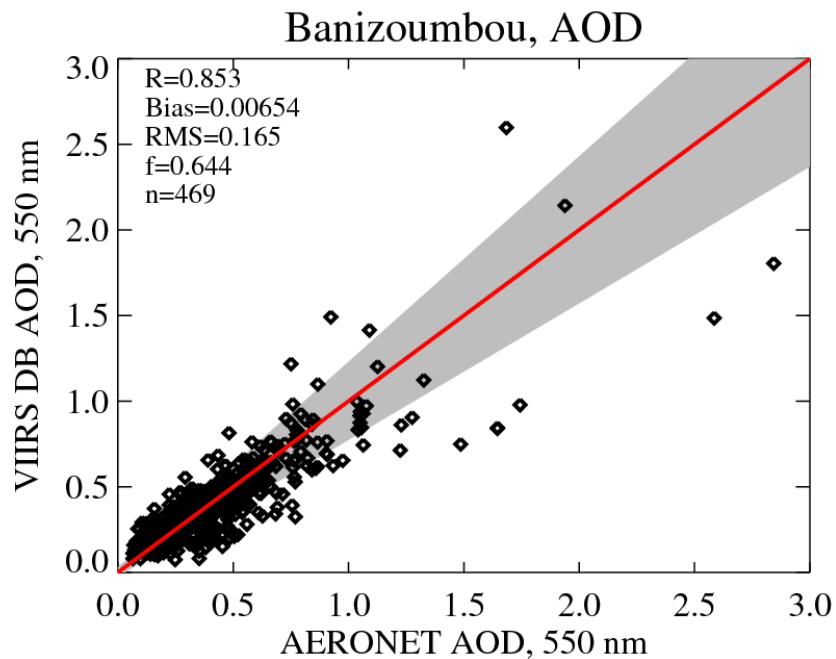
# Retrieval quality seems comparable to MODIS... ... over vegetated/suburban land



- Shaded 'expected error' confidence interval of  $\pm(0.05+20\%)$

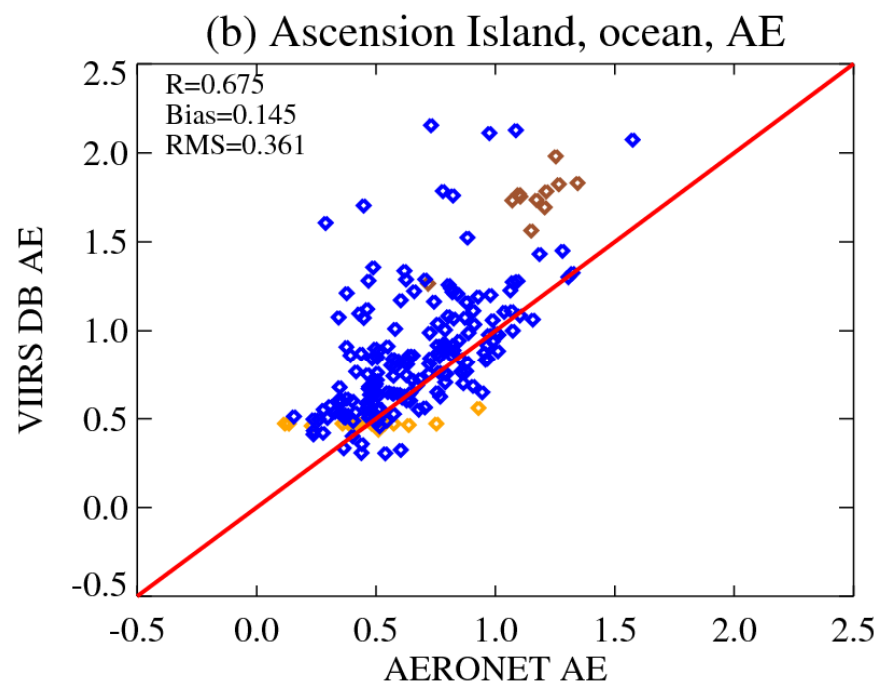
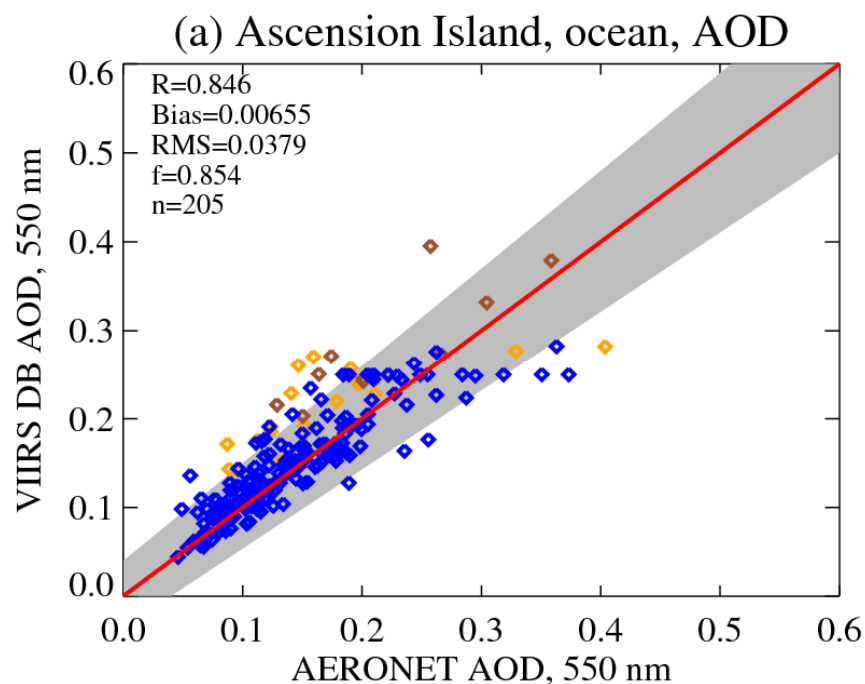


# Retrieval quality seems comparable to MODIS... ... over arid land



- Shaded 'expected error' confidence interval of  $\pm(0.05+20\%)$

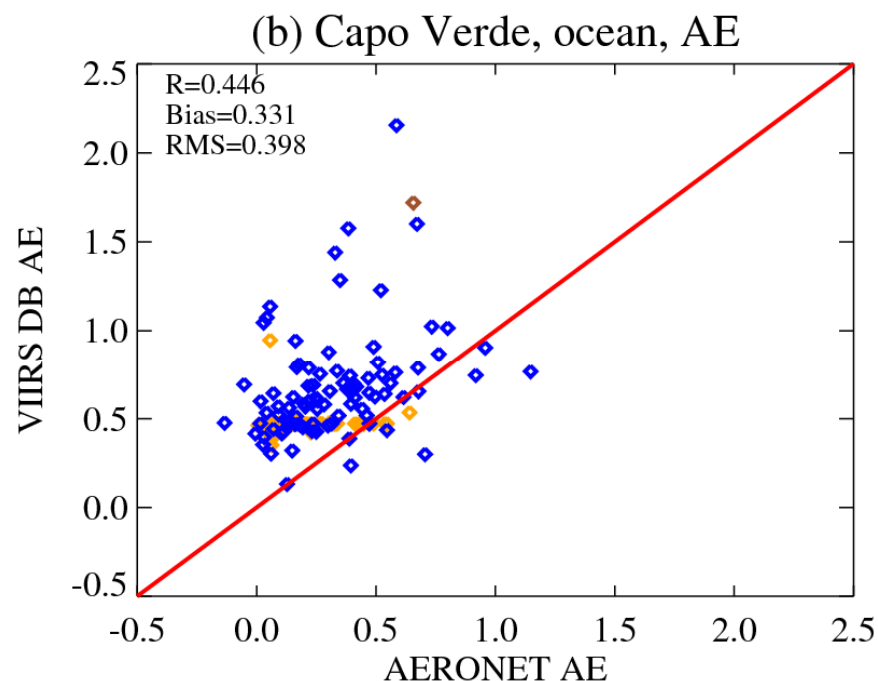
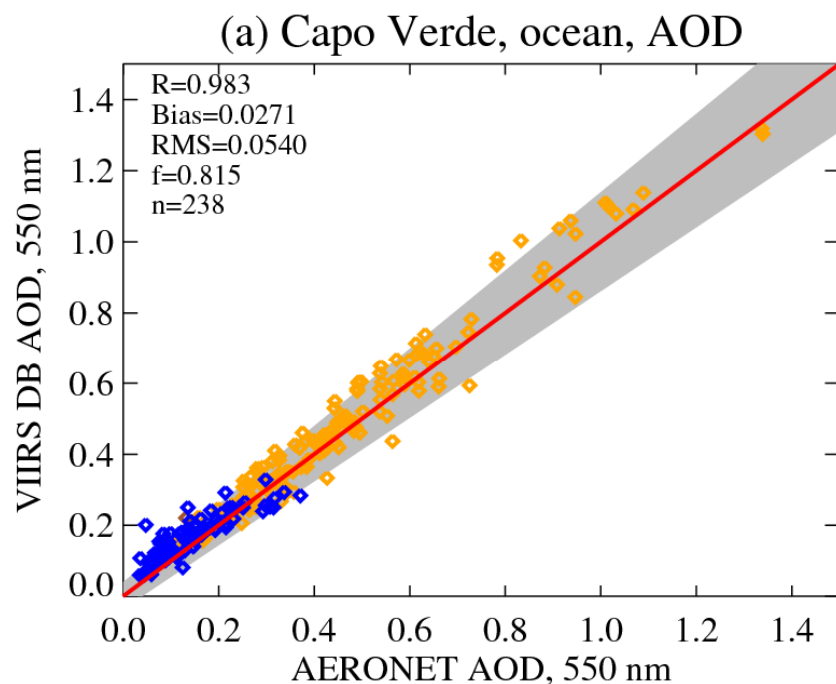
# Retrieval quality seems comparable to MODIS... ... over water



- Shaded 'expected error' confidence interval of  $\pm(0.04+10\%)$
- Colours indicate aerosol optical model (retrieved, not prescribed):  
maritime, dust, fine-mode dominated



# Retrieval quality seems comparable to MODIS... ... over water



- Shaded 'expected error' confidence interval of  $\pm(0.04+10\%)$
- Colours indicate aerosol optical model (retrieved, not prescribed):  
maritime, dust, fine-mode dominated

# We like hearing from data users

- Centralised Deep Blue website coming soon! Meanwhile:
  - SeaWiFS version 4 – <http://disc.gsfc.nasa.gov>
  - MODIS Collection 6 – <http://modis-atmos.gsfc.nasa.gov/>
  - VIIRS first release later this year
    - Will be archived at <http://ladsweb.nascom.nasa.gov/data/>, alongside MODIS data
    - Near real-time (NRT) data will also be available via LANCE: <https://earthdata.nasa.gov/data/near-real-time-data>

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